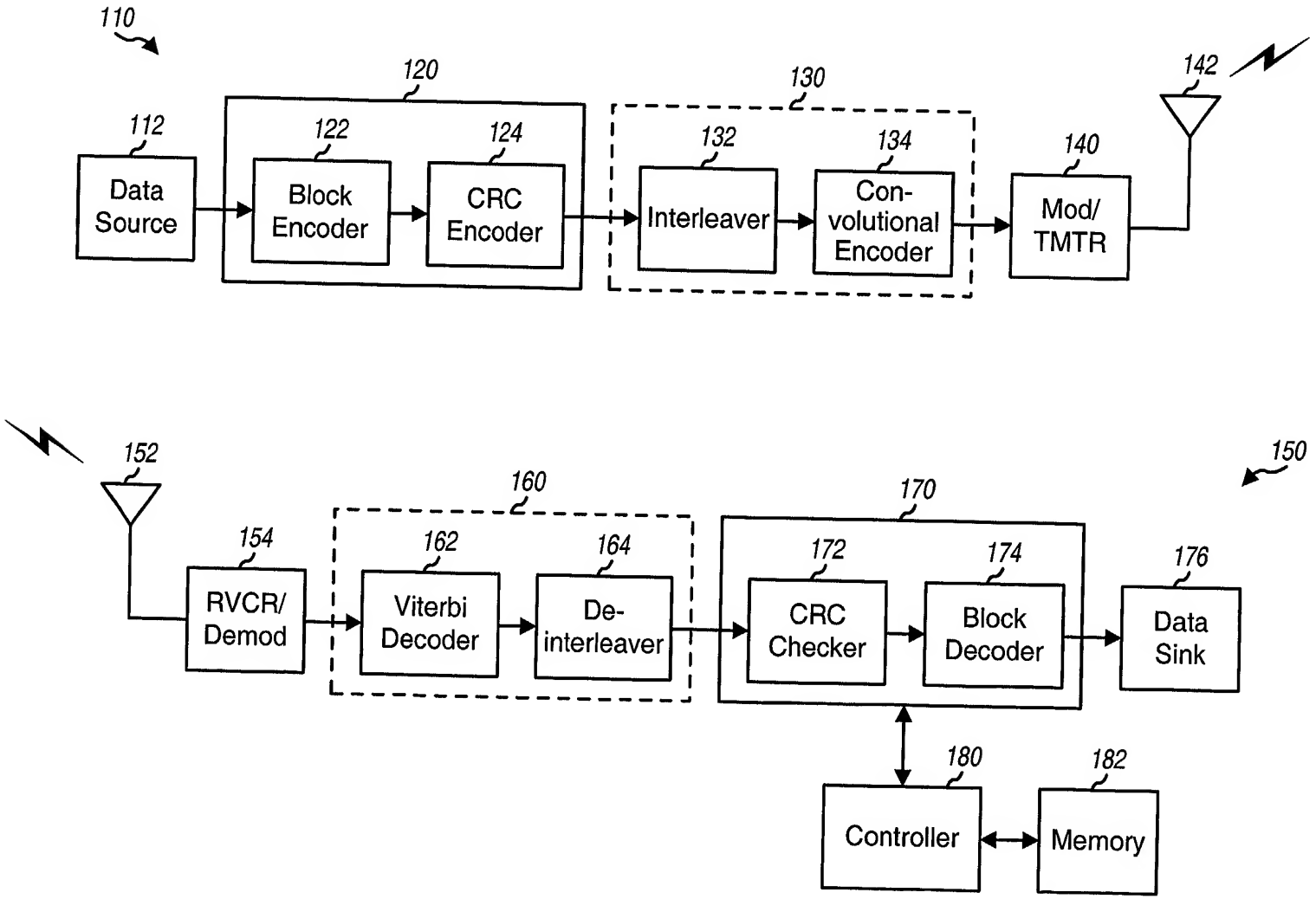
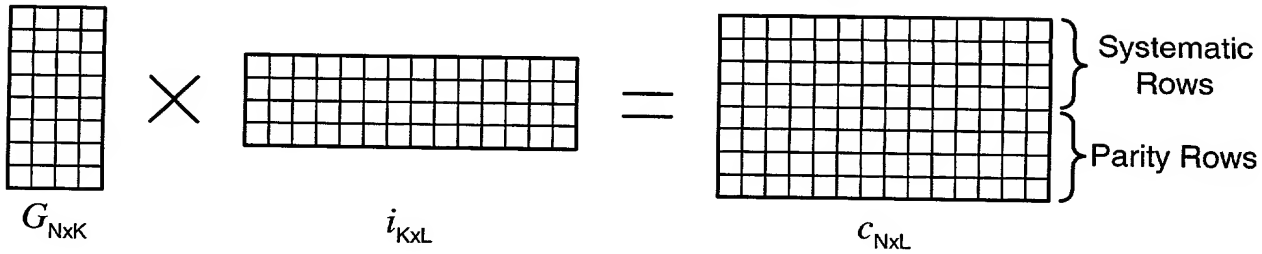


FIG. 1

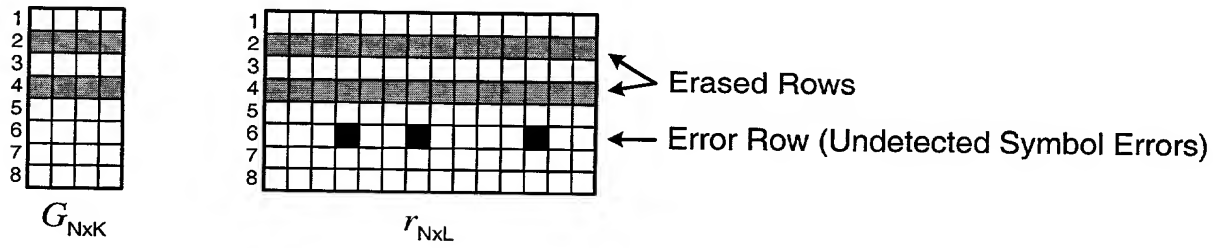
Transmitter

Step 1: Encode an information block, i_{KxL}, by pre-multiplying it with a generator matrix, G_{NxK}, to derive a coded block, c_{NxL}.

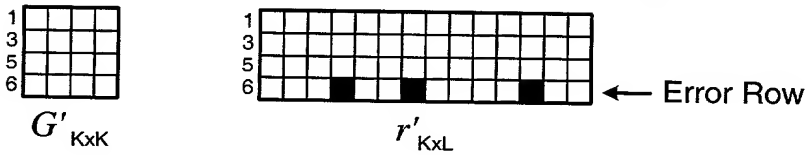


Receiver

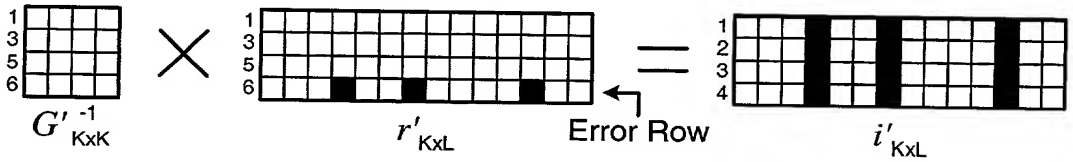
Step 2: Receive the coded block. Determine erased rows in the received block, r_{NxL}, and mark the corresponding rows of the generator matrix as erased.



Step 3: Form a reduced received block, r'_{KxL}, with any K un-erased rows of r_{NxL}, and form a reduced generator matrix, G'_{KxK}, with K corresponding rows of G_{NxK}.



Step 4: Invert G'_{KxK}. Derive an initial estimate of the information block, i'_{KxL}, by multiplying G'^{-1}_{KxK} with r'_{KxL}.



Step 5: Form an estimated information block, $\hat{i}_{KxL}$, by replacing the erased systematic rows of the received block, r_{NxL}, with the corresponding rows of i'_{KxL}.

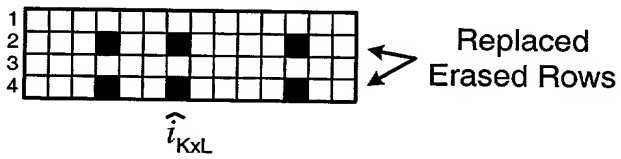
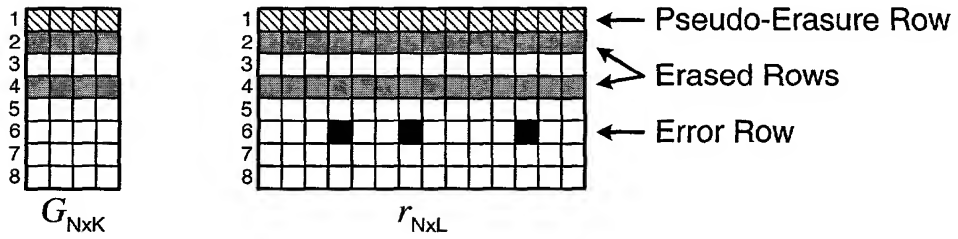


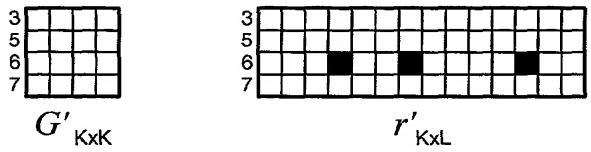
FIG. 2

Receiver

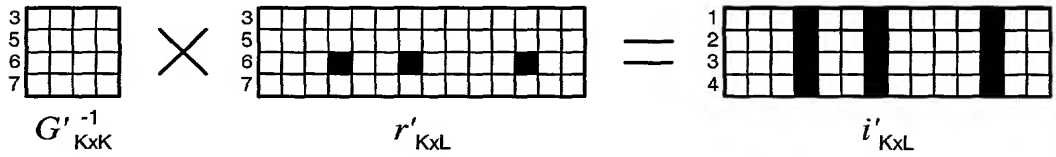
Step 3: Select an un-erased systematic row in the received block to be a pseudo-erasure row. Mark the corresponding row in the generator matrix as erased.



Step 4: Form a reduced received block, r'_{KxL}, with any K un-erased rows of r_{NxL}, and form a reduced generator matrix, G'_{KxK}, with K corresponding rows of G_{NxK}.



Step 5: Invert G'_{KxK}. Derive an initial estimate of the information block, i'_{KxL}, by multiplying G'^{-1}_{KxK} with r'_{KxL}.



Step 6: Compare the pseudo-erasure row against the corresponding row of i'_{KxL} and identify the location of an unmatched symbol. Perform error location on a codeword corresponding to a column containing the unmatched symbol.

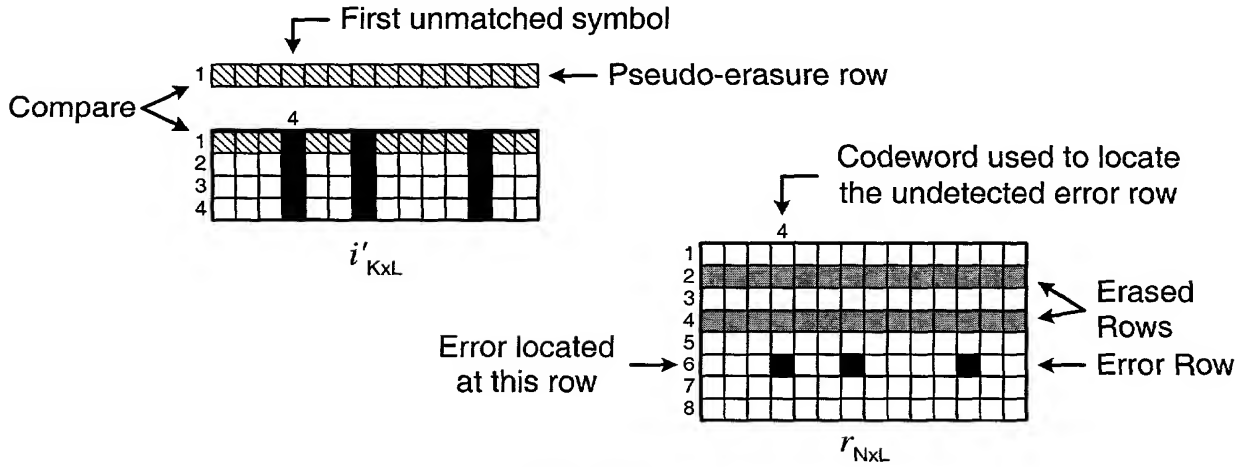
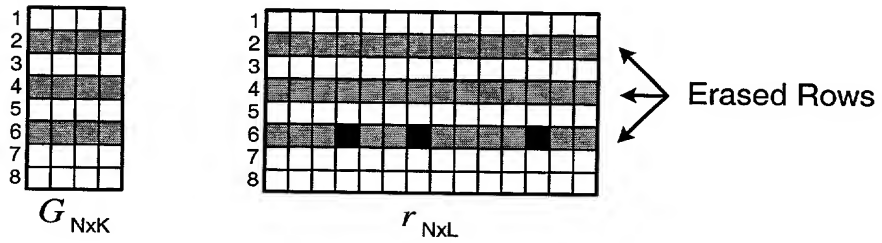
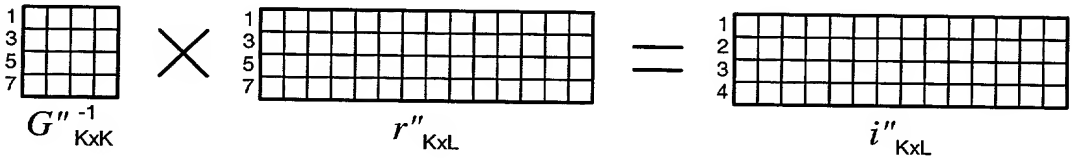


FIG. 3A

Step 7: Mark the row with the symbol error as an erased row. Mark the pseudo-erasure row as un-erased. Form a new reduced received block, r''_{KxL}, with any K un-erased rows of r_{NxL}, and form a new reduced generator matrix, G''_{KxK}, with K corresponding rows of G_{NxK}.



Step 8: Repeat Step 5. Invert G''_{KxK}. Derive a new initial estimate of the information block, i''_{KxL}, by multiplying G''^{-1}_{KxK} with r''_{KxL}.



Step 9: Form an estimated information block, $\hat{i}_{KxL}$, by replacing the erased systematic rows of the received block, r_{NxL}, with the corresponding rows of i''_{KxL}.

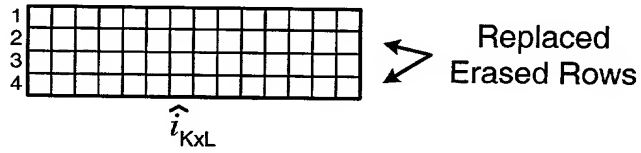


FIG. 3B

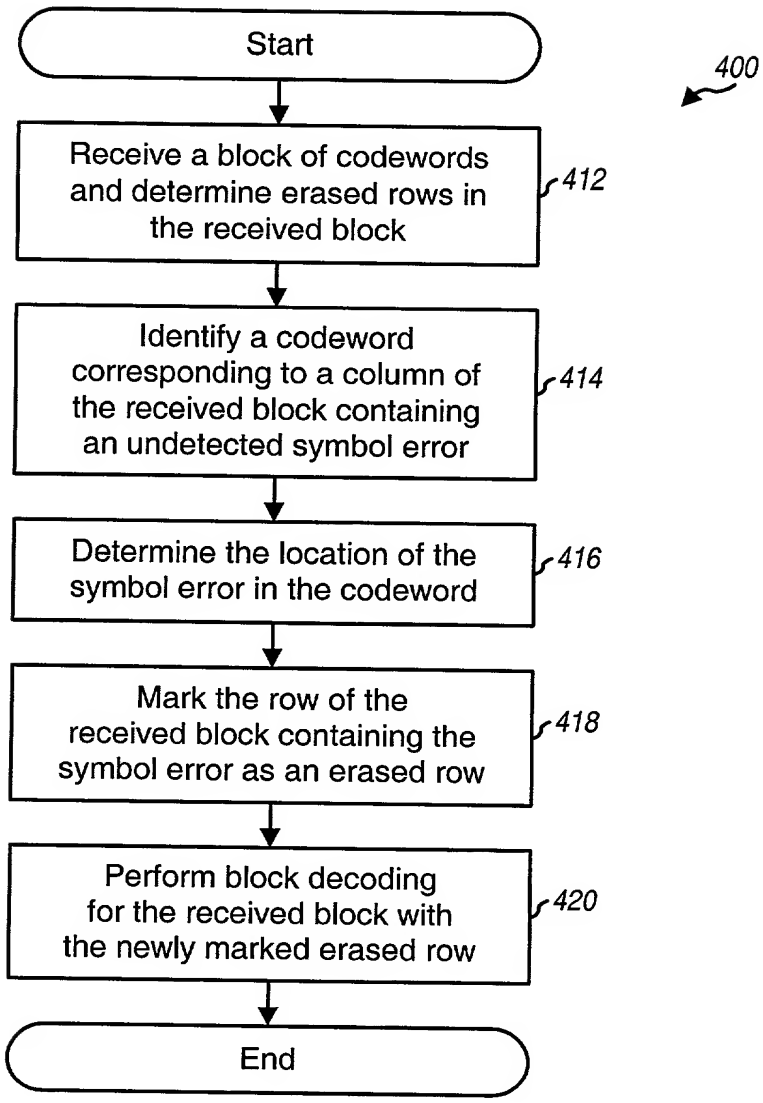

Start
400
Receive a block of codewords and determine erased rows in the received block
412
Identify a codeword corresponding to a column of the received block containing an undetected symbol error
414
Determine the location of the symbol error in the codeword
416
Mark the row of the received block containing the symbol error as an erased row
418
Perform block decoding for the received block with the newly marked erased row
420
End

FIG. 4

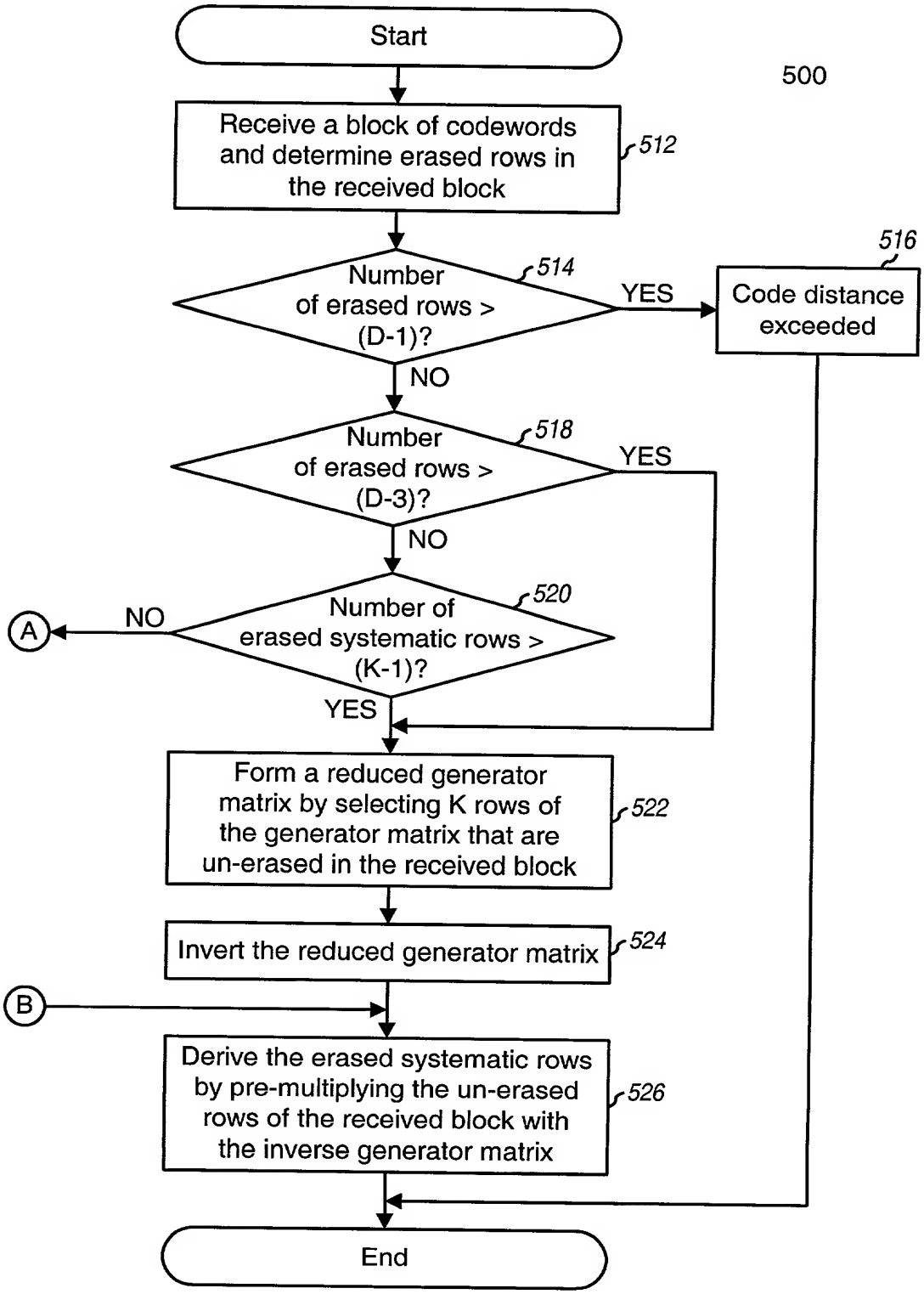

Start
500
Receive a block of codewords and determine erased rows in the received block
512
Number of erased rows > (D-1)?
514
YES
516
Code distance exceeded
NO
Number of erased rows > (D-3)?
518
YES
NO
Number of erased systematic rows > (K-1)?
520
NO
A
YES
Form a reduced generator matrix by selecting K rows of the generator matrix that are un-erased in the received block
522
Invert the reduced generator matrix
524
B
Derive the erased systematic rows by pre-multiplying the un-erased rows of the received block with the inverse generator matrix
526
End

FIG. 5A

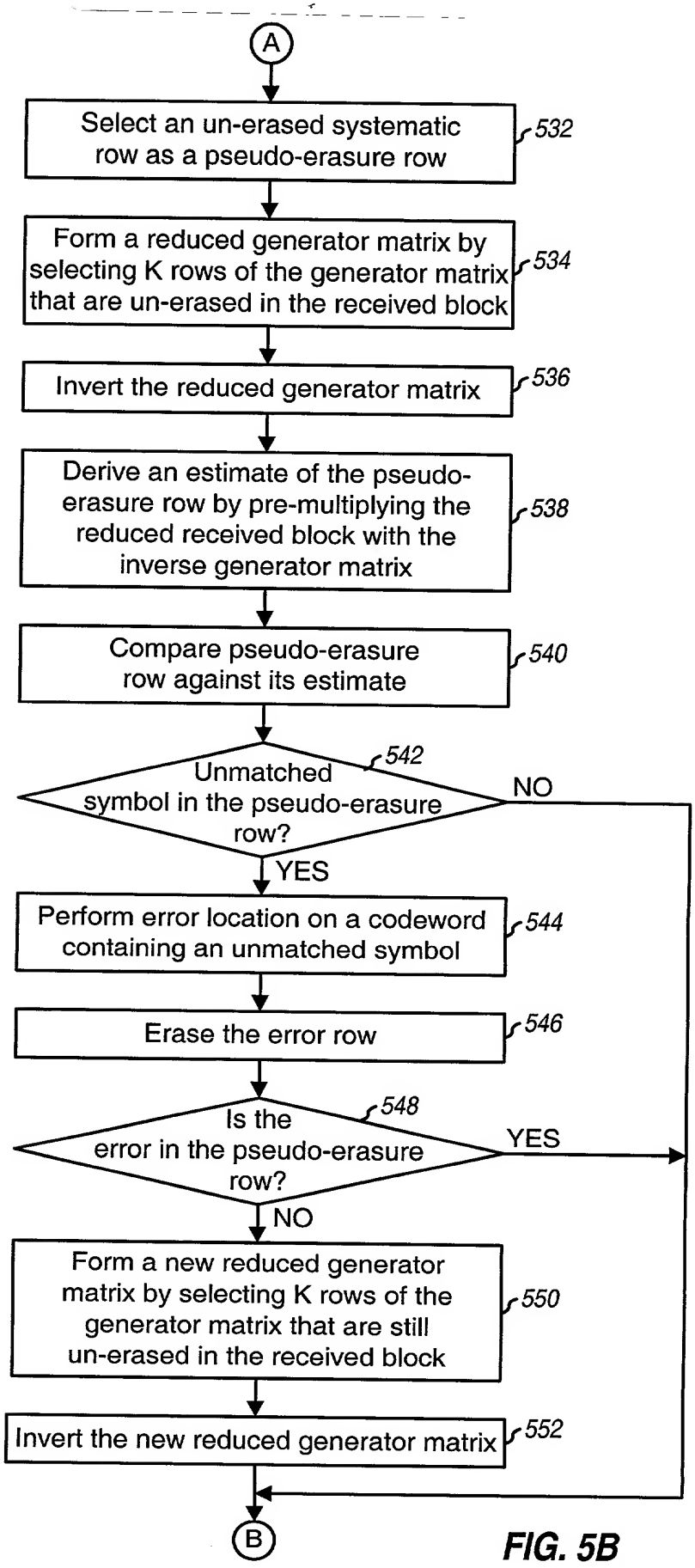

A
Select an un-erased systematic row as a pseudo-erasure row
532
Form a reduced generator matrix by selecting K rows of the generator matrix that are un-erased in the received block
534
Invert the reduced generator matrix
536
Derive an estimate of the pseudo-erasure row by pre-multiplying the reduced received block with the inverse generator matrix
538
Compare pseudo-erasure row against its estimate
540
Unmatched symbol in the pseudo-erasure row?
542
NO
YES
Perform error location on a codeword containing an unmatched symbol
544
Erase the error row
546
Is the error in the pseudo-erasure row?
548
YES
NO
Form a new reduced generator matrix by selecting K rows of the generator matrix that are still un-erased in the received block
550
Invert the new reduced generator matrix
552
B

FIG. 5B